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Office Memorandum • UNITED STATES GOVERNMENT

TO : The Files

1956

FROM : [REDACTED]

SUBJECT: RD-107, Task Order 2. Power Source Development

1. A visit was made to the [REDACTED] New York on 11 October 1956 to monitor development activity under the subject task order. Present were:

[REDACTED]

2. The contractor is in receipt of translated Soviet scientific papers on thermocouples obtained from [REDACTED] and in addition has had some contacts with qualified scientists who have conferred directly with [REDACTED] lectured on Soviet thermocouple development during a visit to France and Canada. As a result of the above, the contractor is convinced that the USSR has a thermocouple with a 10% efficiency, at least in the laboratory and perhaps in production. [REDACTED] is of the opinion that the USSR lags one year in semiconductor research, is even with the U.S. in ferrite development and leads the U.S. in thermocouple design by two years.

3. The significance of high efficiency thermocouples compares with the importance of the transistor. Thermocouples, as a power source, convert heat to electrical energy. Conversely, the application of a DC potential across the couple increases the molecular agitation and liberates heat. However, if the polarity of the applied voltage is reversed molecular agitation is arrested and heat is absorbed. This latter action is known as the Peltier effect and is the key to electronic refrigeration. There are immediate applications for a device of such efficiency in missile and supersonic aircraft design as well as in the refrigeration and air conditioning industry. The enthusiasm with which this high-efficiency thermocouple was received left me with the impression that [REDACTED] is ready and willing to make available its own scientific talent and money to further thermocouple efficiency once physical proof of Soviet accomplishments are established. See Paragraph 4 below.

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5. Thermocouple and transistor development are similar in that element purification and control of added impurities is required. The contractor has constructed an oven designed along lines suggested by [redacted] (a consultant and perhaps the most noted authority on thermoelectric generators in the U.S.). Calibration of the oven was in progress at the time of this visit.

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6. Laboratory tests on the [redacted] charger have been performed which indicate that the 1000 watts of energy available from a Bunsen burner would provide a 25 watt output for an efficiency of 2.5%. Heat transfer characteristics studied outside the laboratory with different types of fires (producing from 550 watts to 925 watts at the hot junction) indicated that perhaps 9 to 15 watts of electrical energy, (an efficiency somewhere between 1.5% and 2%) would be available from lower energy heat sources.

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7. No progress has been made on the hydrogen fuel cell nor solid electrolyte since the last visit. [redacted] were both concentrating on the thermocouple problem and that a [redacted] [redacted] would be assigned to solid electrolyte investigations for the next few months. [redacted] has worked on silver-bromide cells for [redacted] under a Navy Ordnance contract recently interrupted.

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8. The undersigned accepted delivery of 5 narrowband and 1 broadband ferrite antennas.

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Attachment:

Quarterly Report #1

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